Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 13 (4): 127–134
https://doi.org/10.15560/13.4.127

PENSOFT

First record of the Vulnerable bat *Furipterus horrens* (Cuvier, 1828) (Chiroptera: Furipteridae) in the state of Paraná, southern Brazil

Tatiana P. Portella,[1] Nathalia Y. Kaku-Oliveira,[2] Jennifer de S. Barros,[3] Gisele C. Sessegolo[4]

1 Rua Santos Dumont, CEP 75805-025, Jataí, GO, Brazil. **2** Rua Mercedes Stresser, CEP 82820-240, Curitiba, PR, Brazil. **3** Universidade Federal de Lavras, Centro de Estudos em Biologia Subterrânea, Campus Universitário, CEP 37200-000, Lavras, MG, Brazil. **4** Ecossistema Consultoria Ambiental, Rua Dionízio Baglioli, CEP 81510-540, Curitiba, PR, Brazil.
Corresponding author: Tatiana P. Portella, portellatp@gmail.com

Abstract
We report the first record of *Furipterus horrens* (Cuvier, 1828) in the state of Paraná, southern Brazil. A male specimen was captured using a harp trap in the entrance of a cave in the Parque Municipal Gruta do Bacaetava. The morphometric data and morphological characters of the specimen are within the known range documented for this species. This new record fills a gap in the known distribution of *F. horrens* and provides potentially valuable information that can be used to plan conservation measures.

Key words
Araucaria Forest; Thumbless Bat; Cave Bat; karst area; Parque Municipal Gruta do Bacaetava.

Academic editor: Paúl M. Velazco | Received 9 January 2017 | Accepted 19 May 2017 | Published 21 July 2017

Citation: Portella TP, Kaku-Oliveira NY, Barros JS, Sessegolo GC (2017) First record of the Vulnerable bat *Furipterus horrens* (Cuvier, 1828) (Chiroptera: Furipteridae) in the state of Paraná, southern Brazil. Check List 13 (4): 127–134. https://doi.org/10.15560/13.4.127

Introduction

The Thumbless Bat, *Furipterus horrens* (Cuvier, 1828), belongs to the family Furipteridae in which only 2 genera are included: *Amorphochilus* Peters, 1877 and *Furipterus* Bonaparte, 1837. It is one of the smallest Neotropical bats, with a weight spanning 3–5 g (Nowak 1994) and can be recognized by the presence of a dense grayish fur, a truncated and disc-shaped muzzle, pointed ears and inconspicuous thumbs (Gardner 2008). They feed exclusively on flying insects (Nowak 1994), and although the limited information on habitat use, *F. horrens* inhabits mainly caves, especially nearby forested areas and streams (Handley 1976, Uieda et al. 1980, Guimarães and Ferreira 2014).

Furipterus horrens occurs from Costa Rica to southern Brazil, including Bolivia, Colombia, French Guiana, Guyana, Peru, Suriname, Trinidad and Tobago, and Venezuela (Gardner 2008, Peracchi et al. 2011). In Brazil, this species is present in all regions, with confirmed records in 14 states: Amazonas, Bahia, Ceará, Distrito Federal, Espírito Santo, Goiás, Minas Gerais, Pará, Pernambuco, Piauí, Rio de Janeiro, Santa Catarina, São Paulo, Sergipe, and Tocantins (Leal et al. 2014).

Although *Furipterus horrens* is widely distributed it has been rarely recorded in Brazil, and it is currently categorized as Vulnerable in the Brazilian Red List of threatened species (MMA 2014). The sensitivity of this species to environmental alterations and the growing depletion of caves, which are their main natural diurnal roost, are one of the greatest threats to the conservation of *F. horrens* populations (Guimarães and Ferreira 2014).

A recent study on the conservation status of caves in

Copyright *Portella et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Brazil estimated that only 35% of the caves recorded in the database of the federal government have been effectively protected until 2012 (Sessegolo 2013). Therefore, new occurrence records and data on colonies of *F. horrens* are very important to protect this species. Thus, we report the first record of *F. horrens* in the state of Paraná, southern Brazil, in one of the few protected areas in the state dedicated to cave protection, namely the Parque Municipal Gruta do Bacaetava in the municipality of Colombo.

Methods

The Parque Municipal Gruta do Bacaetava is located in the Atlantic Forest biome in a secondary vegetation of Ombrophilous Misty Forest (IBGE 2012). The Gruta do Bacaetava (25°13′55″ S, 049°12′27″ W WGS84, elevation 978 m) is 695 m long and 2 main passages: the lower passage, where the Bacaetava River is located, receives a large number of tourists than the higher passage, which is dry and less visited.

On 29 May 2015 during a bat survey part of the review of the management plan of the Parque Municipal Gruta do Bacaetava 1 specimen of *Furipterus horrens* was collected. Two mist nets (12 × 3 m and 6 × 3 m) were used to cover the openings of the lower passage. Additionally, a harp trap was set up at the opening of the higher passage and the remaining spaces between the trap and the opening were closed (Fig. 1). The traps were operated between 17:30 h and 21:50 h. The captured specimens were weighted and sexed, and their developmental stage (adult or young) and reproductive conditions were recorded. We caught a male specimen of *F. horrens* at the higher passage at 17:50 h using a harp trap (Fig. 2). Along with the specimen of *F. horrens* we captured 1 specimen of *Desmodus rotundus* Geoffroy, 1810.

The specimen of *Furipterus horrens* was fixed in 10% formaldehyde and preserved in 70% ethanol, with a subsequent extraction of the skull. After recording the external and cranial measurements following Moratelli et al. (2011), the individual was deposited at the Coleção

Figure 1. Harp trap installed in the superior entrance of Gruta do Bacaetava, Parque Municipal Gruta do Bacaetava, Colombo, Paraná, southern Brazil.

Figure 2. Adult male *Furipterus horrens* (DZUP-CCMZ 2185) captured at Gruta do Bacaetava in the Parque Municipal Gruta do Bacaetava, Colombo, Paraná, southern Brazil.

Científica de Mastozoologia da Universidade Federal do Paraná (DZUP-CCMZ 2185).The specimen was collected under permit number 43322-2 by ICMBIO\SISBIO.

Results

Our voucher specimen conforms with all the morphological characteristics of *Furipterus horrens*: small size; dense and long grayish fur, with the ventral region lighter than the dorsal; a greatly reduced thumb which are involved in the wing membrane up to the base of the vestigial nail; pointed ears and short and triangular tragus; large uropatagium exceeding the feet in length when extended and tail extending a little less than ¾ the length of the uropatagium; long an cartilaginous calcar; wide and round cranium, with a short rostrum about half the length of the braincase; short palate does not extending well beyond the last molar (Husson 1962, Uieda et al. 1980, Nowak 1994, Reis and Gazarini 2007, Gardner 2008).

The external and craniodental measurements of our specimen fall within the range reported in the literature: forearm length = 36.15 mm; ear length = 9.45 mm; tragus length = 3 mm; tail length = 30.35 mm; hind foot length = 6.35 mm; greatest length of the skull = 12.32 mm; condyloincisive length = 11.31 mm; condylocanine length = 10.49 mm; basal length = 10.32 mm; zygomatic breadth = 7.42 mm; mastoid breadth = 6.32 mm; braincase breadth = 6.09 mm; postorbital breadth = 3.28 mm; breadth across upper molars = 4.66 mm; maxillary toothrow length = 4.48 mm; mandibular length = 8.16 mm; mandibular toothrow length = 5.40 mm; and weight = 4 g (Husson 1962, Uieda et al. 1980, Pol et al. 2003, Reis and Gazarini 2007, Gardner 2008, Sato et al. 2011, Novaes et al. 2012, Duda et al. 2012, Leal et al. 2014).

Discussion

Furipterus horrens has been recorded in the states of São Paulo, in the municipality of Iporanga (Trajano 1984, Trajano and Gnaspini-Netto 1990), and in Santa

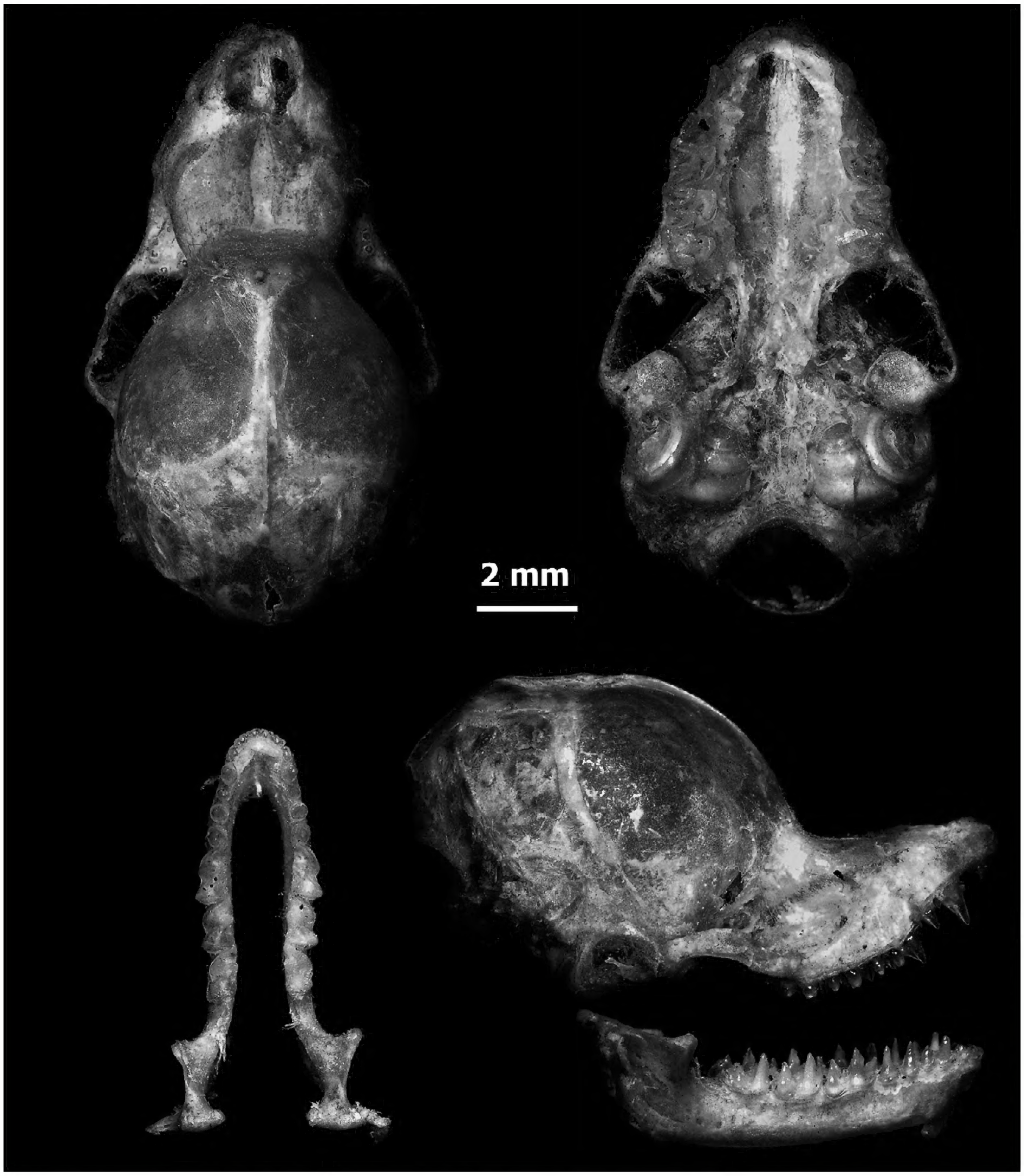

Figure 3. Dorsal, ventral and lateral views of the skull, and dorsal and lateral views of the mandible of a *Furipterus horrens* (DZUP-CCMZ 2185) specimen collected at Gruta do Bacaetava, Parque Municipal Gruta do Bacaetava, Colombo, Paraná, southern Brazil.

Catarina, municipality of Corupá (Lima 1926, Cherem et al. 2004) near the border with Paraná (Fig. 4, Table 1). Thus, it was expected that this species would occur in Paraná. With this new record, the number of bat species known to Paraná has now increased to 70 (Bianconi et al. 2009, Scultori et al. 2009, Passos et al. 2010, Moratelli et al. 2011, Carvalho et al. 2014). Although recently there has been an increase in the number of bat records in the Atlantic Forest of Paraná, a number of factors such as fewer long-term monitoring schemes and the routine use of mist nets for recording species have been detrimental to improving the knowledge on Paraná's bat diversity (Varzinczak et al. 2016).

Because the mist net is the most effective technique to catch frugivorous bats of the family Phyllostomidae, insectivorous bats species inhabiting forests are usually under sampled when this method is used; this is probably due to their capacity to detect this type of trap by echolocation (Kunz and Parsons 2009). Previous studies in the states of Ceará, Distrito Federal, and Tocantins showed that individuals of *F. horrens* were able to detect mist nets and maneuver to avoid them (Uieda et al. 1980, Bredt et

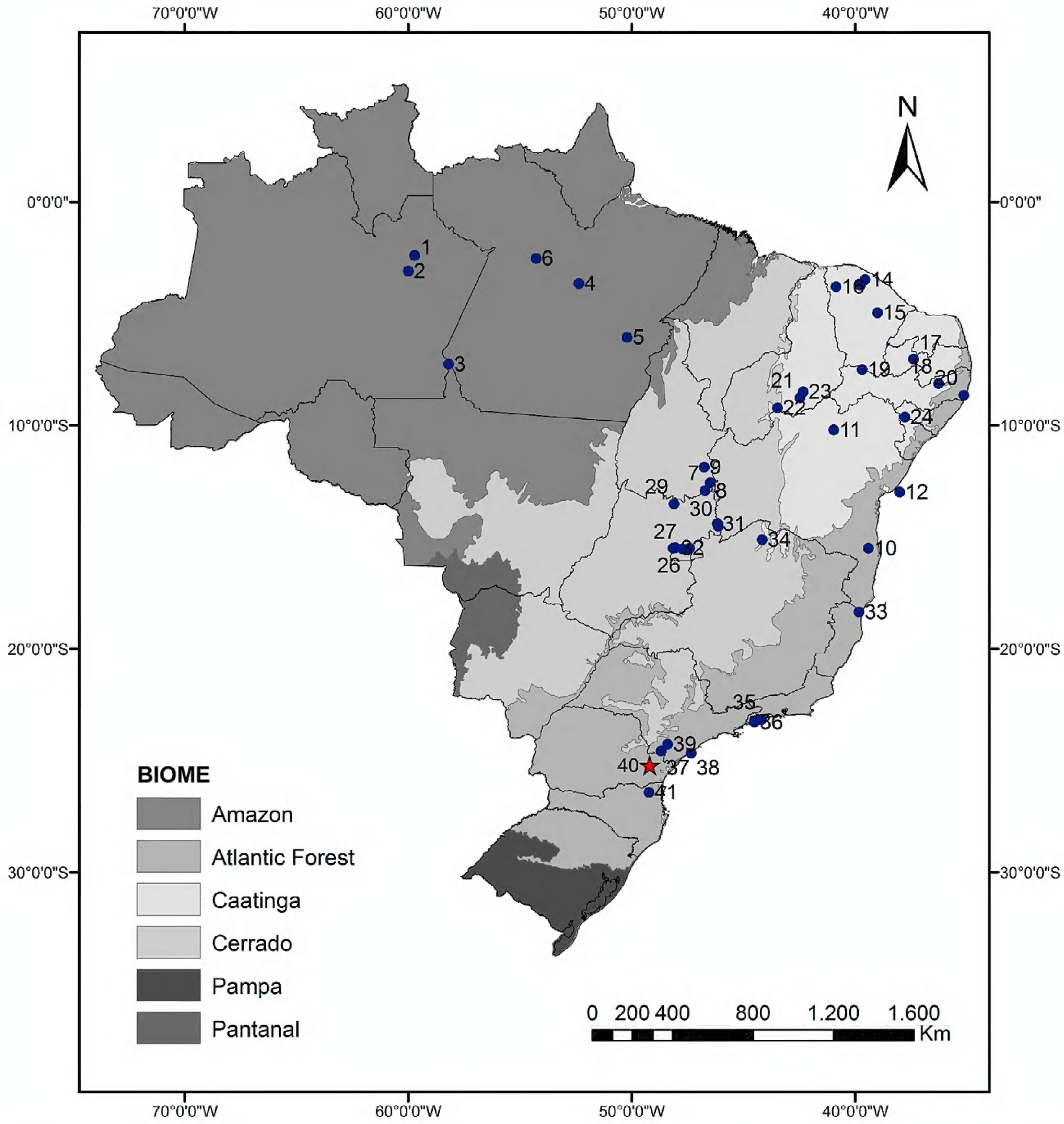

Figure 4. Known records of *Furipterus horrens* in Brazil (blue circles), including the new record (red star) from the Parque Municipal Gruta do Bacaetava in Colombo, Paraná, southern Brazil. Numbers refer to entries in Table 1.

al. 1999, Sato et al. 2011). Uieda et al. (1980) and Bredt et al. (1999) used insect nets instead of mist nets to sample this species with great success. Additionally, visual inspections during the daylight hours (active search) and mist nets were used in an inventory of bat species in forested areas in the states of Piauí, Rio de Janeiro and Tocantins, but only active searching was successful in detecting *F. horrens* (Esbérard et al. 2006, Gregorin et al. 2008, Novaes et al. 2012). In most of the cases in which *F. horrens* was captured with mist nets, the nets were installed blocking the main opening of the structures (e.g. cave) used as roosting spots (Trajano 1984, Trajano & Gnaspini-Netto 1990, Bredt et al. 1999, Silva et al. 2001, Esbérard et al. 2005, Sato et al. 2011, Leal et al. 2014). In addition, *F. horrens* have been captured from their roosting spots either by hand or using insect nets in the states of Ceará, Espírito Santo, and Rio de Janeiro (Pol et al. 2003, Fabián 2008, Duda et al. 2012). Similar results were obtained by Simmons and Voss (1998) in Paracou, French Guiana, in which 12 out of 13 specimens of *F. horrens* recorded were caught with active search and only 1 specimen was shot during flight.

Although active search during daylight hours has been used successfully to detect *F. horrens* (Simmons and Voss 1998, Pol et al. 2003, Esbérard et al. 2006, Gregorin et al. 2008, Noaves et al. 2012), this method was not effective to find this species at Gruta do Bacaetava. This might be attributed to the presence of small gaps between rocks and passages that are too small to allow access to a collector but not to a small bat such as *F. horrens*.

Table 1. Localities records of *Furipterus horrens* in Brazil. The numbers refer to points shown in Figure 4.

No.	Locality	State	Biome	Latitude (S)	Longitude (W)	Author
1	Rei Preto da Eva	Amazonas	Amazon	02°24′	059°43′	Sampaio et al. (2003)
2	Manaus	Amazonas	Amazon	03°06′	0060°00′	Piccinini (1974)[1]
3	Maués	Amazonas	Amazon	07°16′	058°12′	Guimarães (2014)
4	Altamira[3]	Pará	Amazon	03°39′	052°22′	Voss and Emmons (1996), Robinson (1998)[2]
5	Parauapebas	Pará	Amazon	06°04′	050°13′	Tavares et al. (2012)[1]
6	Santarém	Pará	Amazon	02°32′	054°17′	Piccinini (1974)[1]
7	Arraias	Tocantins	Cerrado	12°55′	046°44′	Sato et al. (2011)
8	Aurora do Tocantins	Tocantins	Cerrado	12°34′	046°30′	Novaes et al. (2012)
9	Dianópolis	Tocantins	Cerrado	11° 52′	046° 46′	Guimarães (2014)
10	? (Southern Bahia)	Bahia	Atlantic Forest	?	?	Faria et al. (2006)
11	Campo Formoso	Bahia	Caatinga	10°12′	040°58′	Guimarães (2014)
12	? (Bahia)	Bahia	Atlantic Forest	?	?	Gervais (1856)
13	Irauçuba	Ceará	Caatinga	03°44′	039°47′	Fabián (2008)[1]
14	Itapipoca	Ceará	Atlantic Forest	03°29′	039°34′	Picinini (1974) [1]
15	Quixadá	Ceará	Caatinga	04°58′	039°01′	Astúa and Guerra (2008) [1]
16	Ubajara[3]	Ceará	Caatinga	03°48′	040°52′	Uieda et al. (1980), Silva et al. (2001), Fabián (2008)
17	Santa Terezinha	Paraíba	Caatinga	07°02′	037°24′	Leal et al. (2014)
18	Brejo da Madre de Deus[3]	Pernambuco	Caatinga	08°08′	036°17′	Sousa et al. (2004) [1], Astúa and Guerra (2008) [1]
19	Exu	Pernambuco	Caatinga	07°30′	039°42′	Mares et al. (1981) [1]
20	Rio Formoso	Pernambuco	Atlantic Forest	08°39′	035°09′	Bonato and Facure (2000)
21	Coronel José Dias	Piauí	Caatinga	08°46′	042°29′	Guimarães (2014)
22	Caracol	Piauí	Caatinga	09°13′	043°29′	Gregorin et al. (2008)
23	São Raimundo Nonato	Piauí	Caatinga	08°30′	042°20′	Araújo et al. (1998) [1]
24	Canindé de São Francisco	Sergipe	Caatinga	09°38′	037°47′	Astúa and Guerra (2008) [1]
25	Brasília	Distrito Federal	Cerrado	15°30′	047°25′	Bredt and Uieda (1996)
26	Brazlândia	Distrito Federal	Cerrado	15°30′	048°09′	Bredt et al. (1999)
27	Planaltina	Distrito Federal	Cerrado	15°32′	047°44′	Bredt et al. (1999)
28	Sobradinho	Distrito Federal	Cerrado	15°33′	047°49′	Bredt et al. (1999)
29	Cavalcante	Goiás	Cerrado	13°31′	048°07′	Guimarães (2014)
30	Damianópolis	Goiás	Cerrado	14°31′	046° 08′	Guimarães (2014)
31	Mambaí[3]	Goiás	Cerrado	14°24′	046°11′	Coimbra et al. (1982) [1], Esbérard et al. (2005)
32	Padre Bernardo[3]	Goiás	Cerrado	15°29′	048°03′	Bredt et al. (1999), Bredt and Magalhães (2006)[2]
33	Conceição da Barra	Espírito Santo	Atlantic Forest	18°21′	039°50′	Duda et al. (2012)
34	Itacarambi[3]	Minas Gerais	Caatinga	15°07′	044°10′	Tavares et al. (2010), Guimarães (2014)
35	Angra dos Reis	Rio de Janeiro	Atlantic Forest	23°10′	044°12′	Esbérard et al. (2006)
36	Parati	Rio de Janeiro	Atlantic Forest	23°17′	044°31′	Pol et al. (2003)
37	Iporanga[3]	São Paulo	Atlantic Forest	24°34′	048°42′	Trajano (1984), Trajano & Gnaspini (1991)
38	Peruíbe	São Paulo	Atlantic Forest	24°40′	047°21′	Gimenez & Ferrarezi (2004) [1]
39	Ribeirão Grande[3]	São Paulo	Atlantic Forest	24°16′	048°24′	Portfors et al. (2000), Passos et al. (2003)
40	Colombo	Paraná	Atlantic Forest	25°13′	049°12′	Present study
41	Corupá	Santa Catarina	Atlantic Forest	26°25′	049°14′	Lima (1926), Cherem et al. (2004)

[1]Coordinates according to Duda et al. (2012), Novaes et al. (2012) and/or Leal et al. (2014).
[2]Coordinates according to Guimarães (2014).
[3]Locality correspond to more than 2 records.

In this study, in addition to the widely used mist net, we also used a harp trap. Although this type of trap has been rarely used to catch bats in the Neotropical region, it has been employed routinely with great success in the Paleotropical region and has allowed the catching of species that are not easily sampled with the mist net (Kingston et al. 2003, Struebig et al. 2006, Sedlock et al. 2008, Sedlock et al. 2011). It noteworthy that the success of biodiversity assessments of bats is improved if different kinds of sampling methodologies (i.e. mist nets, harp trap, echolocation, and active search) are simultaneously used, as shown in a study in the Parque Estadual de Intervales, São Paulo State, Brazil (Portfors et al. 2000). In that study, different sampling methodologies where used and were able to catch *F. horrens* in the harp trap only.

Although *Furipterus horrens* has been recorded in the hollows of fallen trees (Voss and Emmons 1996) and buildings (Fabián 2008, Duda et al. 2012), this species is more frequently found in caves as showed elsewhere (Uieda et al. 1980, Trajano 1984, Trajano and Gnaspini-Netto 1990, Bredt et al. 1999, Portfors et al. 2000, Silva et al. 2001, Pol et al. 2003, Esberárd et al. 2005, Tavares et al. 2010, Sato et al. 2011, Novaes et al. 2012, Leal et al. 2014, Felix et al. 2016). Furthermore, most of the records obtained outside caves were based on small colonies of 1–6 specimens while records obtained in caves were based on large colonies ranging from 10–250 specimens (Uieda et al. 1980, Bredt et al. 1999, Silva et al. 2001,

Novaes et al. 2012). In French Guiana, *F. horrens* was recorded 9 times in hollows of falling trees, but in none of these records were 2 adults captured together (Simmons and Voss 1998). In a hollow of a fallen tree in Costa Rica, LaVal (1977) found 59 males that were gone after 3 months. In addition, Bredt et al (1999) recorded colonies of *F. horrens* in several caves in central west Brazil that were studied for long periods varying from 3 to 5 years, suggesting that this is a cave-dwelling species. Studies done in the Gruta Ubajara, in Ceará, northeastern Brazil, suggested that *F. horrens* had been using that cave for 21 years, with the first record made in 1977 (Uieda et al. 1980) and the most recent in 1998 (Silva et al. 2001). Therefore, based on the criteria proposed by Arita (1993) and Guimarães and Lopes (2014) and on the available information on *F. horrens* habitat use, we also consider this species to be a cave bat.

The record of *Furipterus horrens* in the Parque Municipal Gruta do Bacaetava, which is one of the few caves available to this species in the region (Sessegolo et al. 1996), stresses the importance in Brazil of protecting caves. Surveys using different sampling methods such as active search in the cave during daylight hours, complemented with the use of harp traps and bioacoustics techniques, are further required to produce an accurate regional distributional map that can be used in conservation efforts for *F. horrens*.

Acknowledgements

We are very grateful to managers and workers of the Parque Municipal Gruta do Bacaetava. The folowing people helped in the fieldwork: Willians P. Munguia, Tarik Kardush and Fabiano Andrade. We would like to thank Mauricio M. Zenker for the English version of this manuscript and Fernando C. Passos, curator of the UFPR mammal collection, for accepting and cataloging the voucher specimen.

Authors' Contributions

TP and JB collected the data, TP and NK identified the specimen, TP, NK, JB, and GS wrote the text.

References

Araújo, AJG, Pessis AM, Guérin C, Dias CMM, Alves C, Salvia ES, Olmos F, Parenti F, Felice GD, Pellerin J, Emperaire L, Chame M, Lage MCSM, Faure M, Guidon N, Medeiros RP, Simões PRG (1998) Parque Nacional da Serra da Capivara, Piauí, Brasil. Fundação Museu do Homem Americano, São Raimundo Nonato.

Arita HT (1993) Conservation biology of the cave bats of Mexico. Journal of Mammalogy 74 (3): 693–702. https://doi.org/10.2307/1382291

Astúa D, Guerra DQ (2008) Caatinga bats in the mammal collection of the Universidade Federal de Pernambuco. Chiroptera Neotropical 14: 326–338. https://chiroptera.unb.br/index.php/cn/article/view/104

Bianconi, GV, Gregorin R, Carneiro DC (2009) Range extension of the Peale's Free-tailed Bat *Nyctinomops aurispinosus* (Molossidae) in Brazil. Biota Neotropical 9 (2): 267–270.

Bonato V, Facure KG (2000) Bat predation by the fringe-lipped bat *Trachops cirrhosus* (Phyllostomidae, Chiroptera). Mammalia 64 (2): 241–243.

Bredt A, Magalhães ED (2006) Os morcegos da APA de Cafuringa. In: Netto PB, Mecenas VV, Cardoso ES (Eds) APA de Cafuringa: a Última Fronteira Natural do DF. Secretaria de Meio Ambiente de Recursos Hídricos, Brasília, p. 259–266.

Bredt A, Uieda W (1996) Bats from urban and rural environments of the Distrito Federal, mid-western Brazil. Chiroptera Neotropical 2: 54–57.

Bredt A, Uieda W, Magalhães ED (1999) Morcegos cavernícolas da região do Distrito Federal, centro-oeste do Brasil (Mammalia, Chiroptera). Revista Brasileira de Zoologia 16 (3): 731–770. https://doi.org/10.1590/S0101-81751999000300012

Carvalho F, Mottin V, Miranda JMD, Passos FC (2014) First record of *Vampyrodes caraccioli* (Thomas, 1889) (Chiroptera: Phyllostomidae) for the state of Paraná, and range extension to southern region of Brazil. Check List 10 (5): 1189–1194. https://doi.org/10.15560/10.5.1189

Cherem JJ, Simões-Lopes PC, Althoff S, Graipel ME (2004) Lista dos mamíferos do estado de Santa Catarina, sul do Brasil. Mastozoología Neotropical 11: 151–184.

Coimbra CEA Jr, Borges MM, Guerra DQ, Mello DA (1982) Contribuição à zoogeografia e ecologia de morcegos em regiões de cerrado do Brasil Central. Boletim Técnico da Revista Brasil Florestal 7: 34–38.

Duda R, Dallapicola J, Costa LP (2012) First record of the smoky bat *Furipterus horrens* (F. Cuvier, 1828) (Mammalia: Chiroptera) in the state of Espírito Santo, southeastern Brazil. Check List 6: 1362–1364. https://doi.org/10.15560/8.6.1362

Esbérard CEL, Motta JA, Perigo C (2005) Morcegos cavernícolas da área de Proteção Ambiental (APA) Nascentes do Rio Vermelho, Goiás. Revista Brasileira de Zoociências 2: 311–325. https://zoociencias.ufjf.emnuvens.com.br/zoociencias/article/view/165/153

Esbérard CEL, Jordão-Nogueira T, Luz JL, Melo GGS, Mangolin R, Jucá N, Santana Lorenzo Raíces D, Enrici MC, Bergallo H (2006) Morcegos da Ilha Grande, Angra dos Reis, RJ, Sudeste do Brasil. Revista Brasileira de Zoociências 8 (2): 147–153.

Fabián ME (2008) Quirópteros do bioma Caatinga, no Ceará, Brasil, depositados no Museu de Ciências Naturais da Fundação Zoobotânica do Rio Grande do Sul. Chiroptera Neotropical 1: 354–359. https://chiroptera.unb.br/index.php/cn/article/view/105

Faria D, Soares-Santos B, Sampaio E (2006) Bats from the Atlantic rainforest of southern Bahia, Brazil. Biota Neotropica 6: 1–13. https://doi.org/10.1590/S1676-06032006000200022

Felix, S, Novaes RLM, Souza RF, Avilla LS (2016) Bat assemblage in a karstic area from northern Brazil: seven new occurrences for Tocantins state, including the first record of *Glyphonycteris sylvestris* Thomas, 1896 for the Cerrado. Check List 12 (6): 1999. https://doi.org/10.15560/12.6.1999

Gardner AL (2008) Family Furipteridae. In: Gardner AL (Ed) Mammals of South America, Volume 1, Marsupials, Xenarthrans, Shrews, and Bats. University of Chicago Press, Chicago, p. 389–392.

Gervais, P (1856) Deuxième mémoire. Documents zoologiques pour servir a la monographie des chéiroptères Sud-Américains; pp. 25–88, in Gervais P (Ed) Mammifères. In: de Castelnau F (Ed) Animaux nouveaux ou rares recueillis pendant l'expédition dans les parties centrales de l'Amérique du Sud, de Rio de Janeiro a Lima, et de Lima au Para; exécutée par ordre du gouvernement français pendant les années 1843 a 1847, sous la direction du comte Francis de Castelnau. Tome 1. P. Bertrand, Paris. https://doi.org/10.5962/bhl.title.48609

Gimenez EA, Ferrarezzi H (2004) Diversidade de morcegos no sudeste da Mata Atlântica. In: Marques OAV, Duleba W (Eds) Estação Ecológica Juréia-Itatins: Ambiente Físico, Flora e Fauna. Holos, Ribeirão Preto, p. 214–330.

Gregorin R, Camignotto AP, Percequillo AR (2008) Quirópteros do Parque Nacional da Serra das Confusões, Piauí, nordeste do Brasil. Chiroptera Neotropical 14: 366–383. https://doi.org/10.1590/

S1676-06032011000100028

Guimarães MM (2014) Morcegos cavernícolas do Brasil: composição, distribuição e serviços ambientais. M.Sc. dissertation, Unviversidade Federal de Lavras, Lavras, 130 pp. http://repositorio.ufla.br/jspui/handle/1/4180

Guimarães MM, Ferreira RL (2014) Morcegos cavernícolas do Brasil: novos registros e desafios para conservação. Revista Brasileira de Espeleologia 2 (4): 1–33.

Handley CO (1976) Mammals of the Smithsonian Venezuelan project. Brigham Young University Science Bulletin 20 (5): 1–91.

Husson AM (1962) The bats of Suriname. Zoologische Verhandelingen 58: 1–282.

IBGE (2012) Manuais técnico da vegetação brasileira. 2nd edition. Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro, 275 pp. http://biblioteca.ibge.gov.br/visualizacao/livros/liv63011.pdf

Kingston T, Francis CM, Akbar Z, Kunz TH (2003) Species richness in an insectivorous bat assemblage from Malaysia. Journal of Tropical Ecology 19: 67–79. https://doi.org/10.1017/S0266467403003080

Kunz TH, Parson S (2009) Ecological and Behavioral Methods for the Study of Bats, 2nd edition. The Johns Hopkins University Press, Baltimore, 901 pp.

LaVal RK (1977) Notes on some Costa Rican bats. Brenesia 10/11: 77–83.

Leal ESB, Gomes-Silva FF, Lira TC, Prado Neto JG, Passos Filho PB (2014) Ocurrence of *Furipterus horrens* (F. Cuvier, 1828) (Chiroptera: Furipteridae) in the state of Paraíba and an update of the distribution of the species in Brazil. Chiroptera Neotropical 20: 1280–1287.

Lima JL (1926) Os morcegos da coleção do Museu Paulista. Revista do Museu Paulista 14: 41–127.

Mares MA, Willig ER, Lacher TE Jr (1981) The mammals of northeastern Brazil: a preliminary assessment. Annals of the Carnegie Museum of Natural History 4: 81–137.

MMA (2014) Portaria nº 444. Lista Nacional Oficial de Espécies da Fauna Ameaçadas de Extinção. Ministério do Meio Ambiente. http://pesquisa.in.gov.br/imprensa/jsp/visualiza/index.jsp?jornal=1&pagina=121&data=18/12/2014

Moratelli R, Peracchi AL, Dias D, de Oliveira JA (2011) Geographic variation in South American populations of *Myotis nigricans* (Schinz, 1821) (Chiroptera, Vespertilionidae), with the description of two new species. Mammalian Biology 76: 592–607. http://doi.org/10.1016/j.mambio.2011.01.003

Novaes LMN, Souza RF, Feliz S, Sauwen C, Jacob G, Avilla LS (2012) New record of *Furipterus horrens* (Cuvier, 1828) (Mammalia, Chiroptera) from the Cerrado of Tocantins state with a compilation of the know distribution with Brazil. Check List 8 (6): 1359–1361. https://doi.org/10.15560/8.6.1359

Nowak RM (1994) Walker's Bats of the World. The Johns Hopkins University Press, Baltimore, 287 pp.

Passos FC, Silva WR, Pedro WA, Bonin MR (2003) Frugivoria em morcegos (Mammalia, Chiroptera) no Parque Estadual Intervales, sudeste do Brasil. Revista Brasileira de Zoologia 20: 511–517. https://doi.org/10.1590/S0101 81752003000300024

Passos, FC, Miranda JMD, Bernardi IP, Kaku-Oliveira NY, Munster LC (2010) Morcegos da Região Sul do Brasil: análise comparativa da riqueza de espécies, novos registros e atualizações nomenclaturais (Mammalia, Chiroptera). Iheringia, Série Zoológica 100 (1): 25–34. http://www.scielo.br/pdf/isz/v100n1/v100n1a04.pdf

Peracchi AL, Lima IP, Reis NR, Nogueira MR, Ortêncio-Filho H (2011) Ordem Chiroptera. In: Reis, NR, Peracchi AL, Pedro WA, Lima IP (Eds) Mamíferos do Brasil. 2nd edition. Nélio Roberto dos Reis, Londrina, p. 155–234.

Piccinini, RS (1974) Lista provisória dos quirópteros da coleção do Museu Paraense Emílio Goeldi (Chiroptera). Boletim do Museu Paraense Emilio Goeldi, Série Zoologia 77: 1–32.

Pol, A, Nogueira MR, Peracchi AL (2003) Primeiro registro da família Furipteridae (Mammalia, Chiroptera) para o Estado do Rio de Janeiro, Brasil. Revista Brasileira de Zoologia 20 (3): 561–563. https://doi.org/10.1590/S0101-81752003000300031

Portfors CV, Fenton MB, Aguiar LMS, Baumgarten JE, Vonhof MJ, Bouchard S, Faria DM, Pedro WA, Rauntenbach NIL, Zortéa M (2000) Bats from Fazenda Intervales, southeastern Brazil—species account and comparison between different sampling methods. Revista Brasileira de Zoologia 17: 533–538. https://doi.org/10.1590/S0101-81752000000200022

Reis NR, Gazarini J (2007) Família Furipteridae. In: Reis NR, Peracchi AL, Pedro WA, Lima IP (Eds) Morcegos do Brasil. Editora da Universidade Estadual de Londrina, Londrina, p. 137–138.

Robinson F (1998) The bats of the Ilha de Maracá. In: Ratter JA, Milliken W (Eds) Maracá: The Biodiversity and Environment of an Amazonian Rainforest. John Wiley and Sons, London, 165–188.

Sampaio EM, Kalko EKV, Bernard E, Rodriguez-Herrera B, Handley CO Jr (2003) A biodiversity assessment of bats (Chiroptera) in a tropical lowland rainforest of Central Amazonia, including methodological and conservation considerations. Studies on Neotropical Fauna and Environment 38: 17–31. https://doi.org/10.1076/snfe.38.1.17.14035

Sato TM, Guimarães M, Uieda W (2011) Primeiro registro de *Furipterus horrens* (Cuvier 1828) para o Estado do Tocantins, Norte do Brasil. Chiroptera Neotropical 17: 190–192. https://chiroptera.unb.br/index.php/cn/article/view/16

Scultori C, Dias D, Peracchi AL (2009) Mammalia, Chiroptera, Phyllostomidae, *Lampronycteris brachyotis* (Dobson, 1879): first record in the state of Paraná, southern Brazil. Check List 5 (4): 872–875. https://doi.org/10.15560/5.4.872

Sedlock JL, Ingle NR, Balete DS (2011) Enhanced sampling of bat assemblages: a field test on Mount Banahaw, Luzon. Fieldiana, Life and Earth Sciences 2: 96–102. https://doi.org/10.3158/2158-5520-2.1.96

Sedlock JL, Weyandt SE, Corcoran L, Damerow M, Hwa SH, Pauli B (2008) Bat diversity in tropical forest and agropastoral habitats within a protected area in the Philippines. Acta Chiropterologica 10: 349–358. https://doi.org/10.3161/150811008X414926

Sessegolo GD (2013) A conservação e o manejo de cavernas no Brasil: lacunas do conhecimento e prioridades para a conservação. PhD Dissertation, Universidade Federal do Paraná, Curitiba, 542 pp. http://acervodigital.ufpr.br/handle/1884/30050

Sessegolo GC, Zakrzewski DP, Theulen V, Silva-da-Rocha LF (1996) A degradação ambiental de cavernas na Região Metropolitana de Curitiba – PR. In: Sessegolo GC, Silva-da-Rocha LF, Theulen V (Eds) Cavernas do Paraná – Dez Anos de Espeleologia. GEEP-Açungui, Curitiba, p. 5–8.

Silva SSP, Guedes PG, Peracchi AL (2001) Levantamento preliminar dos morcegos do Parque Nacional de Ubajara (Mammalia, Chiroptera), Ceará, Brasil. Revista Brasileira de Zoologia 18 (1): 139–144. https://doi.org/10.1590/S0101-81752001000100015

Simmons NB, Voss, RS (1998) The mammals of Paracou, French Guiana: a Neotropical lowland rainforest fauna. Part bats. Bulletin of the American Museum of Natural History 237: 1–219. https://doi.org/10.1206/0003-0090(2001)263<0003:TMOPFG>2.0.CO;2

Sousa MAN, Langguth AR, Gimenez EA (2004) Mamíferos dos Brejos de Altitude Paraíba e Pernambuco. In: Porto K, Cabral JJP, Tabarelli M (Eds) Brejos de Altitude: História Natural, Ecologia e Conservação. Ministério do Meio Ambiente, Brasília, p. 229–254.

Struebig MJ, Galdikas BMF, Suatma (2006) Bat diversity in oligotrophic forests of southern Borneo. Oryx 40: 447–455. https://doi.org/10.1017/S0030605306001190

Tavares VC, Palmuti CFS, Gregorin R, Dornas TT (2012) Morcegos. In: Martins FD, Castilho AF, Campos J, Hatano FM, Rolin SG (Eds) Fauna da Floresta Nacional de Carajás—Estudos Sobre Vertebrados Terrestres. : Nitro Imagens, São Paulo, 163–179.

Tavares VC, Aguiar LMS, Perini FA, Falcão FC, Gregorin R (2010) Bats of the state of Minas Gerais, southeastern Brazil. Chiroptera Neotropical 16: 675–705.

Trajano E (1984) Ecologia de populações de morcegos cavernícolas em uma região cárstica do sudeste do Brasil. Revista Brasileira

de Zoologia 2: 255–320. https://doi.org/10.1590/S0101-81751984000100001

Trajano E, Gnaspini-Netto P (1990) Composição da fauna cavernícola brasileira, com uma análise preliminar da distribuição dos táxons. Revista Brasileira de Zoologia 7: 383–407. https://doi.org/10.1590/S0101-81751990000300017

Uieda W, Sazima I, Storti-Filho A (1980) Aspectos da biologia do morcego *Furipterus horrens*. Revista Brasileira de Biologia 40: 59–66.

Varzinczak LH, Bernardi IP, Passos FC (2016) Is the knowledge of bat distribution in the Atlantic Rainforest sufficient? Comments about new findings and a case study in the Paraná state coastal area, Brazil. Mammalia 80: 263–269. http://doi.org/10.1515/mammalia-2014-0130

Voss RS, Emmons LH (1996) Mammalian diversity in Neotropical lowland rainforests: a preliminary assessment. Bulletin of the American Museum of Natural History 230: 1–115.